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ABSTRACT

To explore communication patterns within organizations, a network analysis was conducted of a large New York financial institution with 98 departments and 66 branches. Functional analysis revealed that departments had more and stronger communication linkages than did branches. Departments were also closer in communication distances than branches. Branches, however, showed higher levels of integration than departments. These results suggest that, in investigations of highly differentiated, complex organizations, focusing on the communication patterns of functional units, rather than of individuals, eases problems in data collection and avoids unreliable self-reports. (MM)

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NETWORK ANALYSIS FROM A FUNCTIONAL PERSPECTIVE

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NETWORK ANALYSIS FROM A FUNCTIONAL PERSPECTIVE

ABSTRACT

Structural-functionalism is an approach to the analysis of social systems that allows researchers to deal with the questions of how and why communication operates in an organization. Network analysis is a means of specifying an organization's communication structure. Questions have been raised, however, about the accuracy of an individual's self-reports about his or her communicative behaviors: Can an individual validly and reliably recall and report his or her interactions over time? If the unit of analysis is changed from the individual (at the interpersonal level) to the functional unit (at the system level), this source of error may be reduced or eliminated and a structural functional analysis performed.

A network analysis was conducted in two divisions of a large financial institution in New York State. Frequency and salience of network linkages as well as communication distance and integrativeness were measured using functional units, (branches and departments), rather than individuals, as the unit of analysis. All hypotheses were supported, providing evidence that departments have more and stronger links than branches as well as shorter communication distances and lower integrativeness. Of more importance was the finding that a functional approach to network analysis has much potential for organizational communication research.

Besides simplifying data collection by requiring less than a census to complete the network survey instrument, the functional approach avoids the error associated with individual self-reported data. Finally, a functional approach allows a shift from a dyadic to a systems approach, including a realistic study of an organization's boundary spanning activity.

THEORY

Structural-functionalism is an approach to the analysis of social systems which allows researchers to deal with the questions of how and why communication operates in an organization (Farace, et al, 1977). The major premise underlying functionalism is that all social systems have a basic need for survival (Parsons, 1951). They strive to maintain the continuity of the system by developing structures necessary to satisfy its recurring needs. On-going organizational activities are interpreted in terms of the functions they serve for the maintenance of the overall system. One of these day to day activities is social interaction. These interactions define the communication structure of the organization (Goldhaber, et al, 1978) which may be accurately described by network analysis (Goldhaber, 1983, Rogers & Kincaid, 1981; Farace, et al, 1977).

A prerequisite for the functioning of any organization is an operational communication system. Those communication structures which have positive consequences will survive over time. From this functional perspective, communication structure is causally related to key performance indicators which have functional or dysfunctional consequences for organizational growth (Hage, 1975).

In meeting the "functional" requirements, social systems must differentiate with respect to task. This is the process of division of labor and specialization, as described by classical theorists. Durkheim (1933) stated that all systems must differentiate and that the more complex the system, the greater the division. He believed that a natural evolution occurs in all organizations starting from homogeneous systems with low division of labor and specialization. They become heterogeneous with a high division of labor and specialization.

Along with differentiation comes the need for integration. In order to survive, an organization's differentiated units must be integrated towards the common goals of the system (Durkheim, 1933). All social systems have a value of their own which is a different and specialized version of the general value system. It is imperative that integration result in a pattern of value congruence at all levels (Parsons, 1960). Integration is the means by which individuals in other specialized units are linked into the system. It results in a sense of solidarity through shared collective consciousness (Durkheim, 1951), organizational climate (Goldhaber, et al, 1973), or organizational culture (Barnett, 1979; Kapp & Barnett, 1983).

Members of organizations are linked through clearly defined expectations associated with their roles within the organization (Duncan, 1971). The concept of role is a major means for linking individuals and organizations (Katz & Kahn, 1978). The organization may be defined as a composite of separate roles, and persons in these roles are linked to others by virtue of the functional requirements of the organization. These requirements are implemented through a set of expectations that are communicated to role occupants. A role may be defined as a range of socially expected

behaviors. In a well integrated systems, members have a clear idea of their role requirements. One of these requirements is who the role occupant should communicate with in order to meet the functional expectations of their role.

The integration of organizational roles can be achieved through a variety of means. March and Simon (1958) suggest that organizations have two ways of coordinating activities: programming and feedback. Parsons (1960) defined them as either sanctions or socialization. Communication is the primary mechanism for coordinating organizational activities. The choice of the integrating mechanism relates specifically to the nature of the task and the level of differentiation in the organization. As tasks increase in uncertainty, communication and feedback become the most effective approaches. Hage, et al (1971) found that as personnel specialization increases, the volume of communication increases because of the necessity of coordinating diverse activities.

Functionalism deals with the issues of goal achievement, integration, and adaptation in its analysis of organizational behavior. This is similar to the task, maintenance and innovative communication functions described by Goldhaber (1983). Also, this exhibits a marked similarity to the writings of contingency theorists (Lawrence & Lorsch, 1967; Thompson, 1967, Duncan, 1972; Galbraith, 1973, 1977) who address the relationship between the organization and the environment.

The environment is viewed as a source of information and uncertainty to which organizational decision makers must react (Thompson, 1967). Uncertainty is located within the cognitive processes of the persons communicating within the system and is defined as the process of enactment (Weick, 1969). In order to cope with this uncertainty, organizations must be able to gather information from the environment and process it internally. This interchange necessitates an information processing model of organizing (Galbraith, 1977). The greater the uncertainty, the greater the processing needs of the organization. Organizations must be able to match highly uncertain environmental conditions with complex information processing mechanisms (Tushman, 1977, 1979).

The information processing capacity is revealed by the organization's internal structure. Burns and Stalker (1961) developed a dichotomy of organizational forms, mechanical and organic, to differentiate processing abilities. Duncan (1972) found a relationship between environmental and organizational structure. Lawrence and Lorsch (1967) found that different parts of the organization face separate task environments and have distinct structural forms. Thus, the more highly differentiated an organization is, the greater the need for internal integrating mechanisms. These studies indicate that organizations, to remain functional, must develop appropriate structures to meet environmental constraints.

What distinguishes the two approaches is that contingency theory is primarily non-directive (Farace, et al, 1977). Contingency theory argues for finding the best set of communication structures under a given set of circumstances. Functionalism seeks an identification and explanation of traits and environmental characteristics. A distinct feature of structural functionalism is the step by step set of procedures to be followed when conducting an analysis (Monge, 1972; Farace, et al, 1977; Nagel, 1956).

The steps in analysis include: Identifying the system (and its component parts); describing the environment; indicating the traits essential for the system's maintenance; specifying the range the "traits" may assume and must assume for survival; and, the mechanisms which keep the traits within the necessary limits must be described. For example, in a banking organization, the first step has already been completed. The component parts include functional support units, i.e., finance, electronic data analysis, investments, loans, customer service, marketing, as well as branch operations. In the second step, the environment relates to the financial community performing transactions to the focal organizations. Communication is the essential attribute necessary for organizational existence. Policies must be communicated among the functional units and to the branches. We can identify whether coordination occurs through programs and sanctions or feedback, socialization, and mutual adjustment (Parsons, 1960; March & Simon, 1958; Thompson, 1967). The values that communication can take range from minimal communication with only a small number of links, to a system of complete connectedness, with all members directly linked to each other.

Network analysis performs the final step by providing a detailed account of how the collective system and traits operate. It describes those mechanisms that keep the traits within the desired range. Ultimately, network analysis may be able to influence the trait to an ideal point where the system is coordinated through a minimal number of links with a tolerable level of uncertainty (Danowski, 1974; Goldhaber, et al, 1983).

Network analysis is a means of specifying an organization's communication structure (Richards, 1975; Rogers & Agarwala-Rogers, 1976; Farace, et al, 1977; Goldhaber, et al, 1978). Generally network analysis collects sociometric data about communication flows and analyzes the patterns by using interpersonal relations as the unit of analysis (Rogers & Agarwala-Rogers, 1976). Typically, data are collected by asking individuals with whom they communicate during a specified time period, although unobtrusive measures and behavioral measures can also be employed (Danowski, 1982; Rice, 1982; Barnett & Palmer, 1983). The unit of analysis may be other than individuals. Danowski (1980) examined the communication of task groups, (Wigand, 1976) described the interorganizational communication, and Barnett and Palmer (1983) describe how the interactions among 31 American cities changed over a 14-year period. Network analysis within organizations is generally carried out in order to determine the nature of communication flow and how the formal and informal structures are related (Goldhaber, et al, 1978).

The analysis is done by identifying cliques (groups) in the system, the communication roles that individual nodes perform, and measuring various structural indices for the system. Among the indices are: connectedness, the degree to which an individual or members of a focal unit is linked to other persons/units; linkage strength, the frequency of interaction among separate links; linkage distance, the average number of links (steps) in the shortest path joining all connected units; and integrativeness, the degree to which units linked to a focal unit are linked to each other.

Typically, network research examines the structural dimensions as an independent variable and investigates the effects on individual behavior and group performance. However, one may examine the variables which determine the structure. There are two main determinants which affect network structure, spatial distance and homophily, the degree of similarity between individuals on a variety of characteristics. We can expect stronger communication links between more proxemic individuals and between those who share similar characteristics (Rogers & Kincaid, 1981).

The more centrally located a unit/individual, the greater the connectedness to others in the system. Rogers and Kincaid (1981) identify this as the principle of least effort. Thus, one would expect, in a system organized around a central office and a number of geographically dispersed branches, to see differing degrees of connectedness, based solely on physical proximity. The more central a unit is, the stronger the communication links to other units and the shorter the number of communication steps between them. The units in the system's periphery can be expected to be less connected and have a greater number of communication steps to one another.

Similar patterns of linkages would also be expected between those units performing similar organizational functions. The organization can be defined as a relatively stable structure of roles (Katz & Kahn, 1978). Individuals occupying similar roles have similar expectations placed on them by organizational members. Given this set of role expectations, we can expect role occupants to have similar communication patterns, and to be more integrated. Role occupants who perform identical functions will be more homophilous and will be more connected to each other. Danowski (1980) found that along certain content networks as groups exchange more messages they become more connected and develop increased attitude conformity. Given a system organized around a central office and peripheral branch functions, if those branch functions are performing identical functions, one would expect them to be communicating more to the same nodes. Thus, individual branches would be more integrated within the overall system.

Network analysis does pose difficulties for research. One question concerns the accuracy with which individual respondents identify their communication contacts (Bernard & Killworth, 1976; Killworth & Bernard, 1977; Bernard, Killworth, & Sailer, 1980, 1982). Does sociometric data actually reflect the lines of communication that are most frequently used (Rogers & Agarwala-Rogers, 1976)? The weaker ties, or less often used links, are seldom reported by respondents and this presents a problem because they are different

from those more consistent "stronger" ties (Granovetter, 1973). The question raised by Farace, et al, (1977) is, to what extent do individuals under or over report their communication links?

Bernard and Killworth (1977) collected four sets of network data using a variety of measurement techniques; unobtrusive, observation, and survey sociometry. Their findings indicate that people do not know, with any accuracy, with whom they communicate. In other words, reports of whom I say I talk to bear little resemblance to those with whom I actually talk. However, Romney and Faust (1982) reanalyzed data from Bernard, et al (1980) and report being able to capture the structure of communication networks from recalled data. Danowski (1980) argues that the group level of analysis appears to filter effectively considerable measurement error from self report data.

Given the weakness which arises from individual self report data, we propose changing the unit of analysis from the interpersonal level to a macro approach using organizational functional units. This approach may prove useful by increasing the accuracy in describing the actual communication flows, particularly in large organizations where higher levels of depersonalized communication are likely to occur. Organizations may be viewed as systems of events and processes (Katz & Kahn, 1978) and this macro perspective will shift the focus to a complete systems analysis (Rogers & Kincaid, 1981). In this way we can examine the communication among functional units.

Given this theoretical premise the following hypotheses may be proposed. In an organization characterized by a central office with distinct functional units (departments) and geographically distributed branches performing equivalent functions:

- H1: Departments will have more communication linkages than branches.
- H2: Departmental communication links will be stronger than branch links.
- H3: The communication distance between departments will be shorter than the branch functions.
- H4: Branches will show higher levels of integrativeness than will departments.

METHOD

A Network Analysis was conducted during the Fall of 1982 in a large financial institution with offices throughout New York State. The organization has approximately 3,000 employees in two divisions. The upstate division has 81 functions, 49 departments and 32 branches. The downstate division has 83 functions, 49 departments and 34 branches in the New York City metropolitan area. In the upstate division, the branches are geographically distributed throughout the Western New York area with some branches up to 85 miles from downtown Buffalo where the departments are located. The downstate division has branches scattered around the New York City metropolitan area. At the time of the survey, there were some additional downstate functions that were in the process of being shifted to the upstate division. They were part of the system but not included for purposes of hypothesis testing. The Network Analysis was part of a larger Communication Audit of the entire organization.

The network instrument was constructed according to guidelines presented by Goldhaber and Rogers (1979) for the ICA Communication Audit with the exception that a 100-point equisection scale was used (Torgerson, 1958) instead of a five-point scale. This was an attempt to allow greater variation in responses (Barnett, et al, 1982). Employees were asked to report the importance of formal and informal communication for a typical work week based on the 100 point scale. 50 was considered an average amount of importance for work-related matters.

A census of the two divisions was conducted. However, due to a low return rate of 29% (N=863, upstate 457, downstate 406), the audit team decided to shift from using the individual as the unit of analysis to a functional approach with branches and departments as the units of analysis. This was accomplished by aggregating the returns for each function to generate a sociomatrix comprising the 81 functions for upstate and the 83 functions for the downstate division. This involved a two-step process where the magnitude of communication activity was first established for each function by cross-tabulation of the raw data. Magnitude of communication was operationalized as the percentage of the respondents of a given unit (branch or department) that indicated communication with each other or specific individuals within that unit. The rate of questionnaire return was high enough to constitute a significant sample of the population. Thus, even though the returns were not drawn from a random sample, the law of large numbers and the central limit theorem operate to ensure stable coefficients. One problem, however, is that returns were uneven across functions. Returns varied from 100% to zero for the surveyed departments and branches. This resulted in exaggerated communication activity in cases where only one or two employees responded from a large department or branch.

The percentages from step one were used as the input for the NEGOPY computer program (Richards, 1975). NEGOPY is the first network analysis computer program designed for analyzing communication networks. It is the most widely used program in communication studies (Rogers & Kincaid, 1981; Richards, 1975, 1976; Rice, 1979; Roberts & O'Reilly, 1978; Goldhaber, et al, 1979; Goldhaber & Rogers, 1979; Albrecht, 1979). It is based on dyadic proximity (the degree of overlap in personal communication networks) and it has the capacity to handle a communication matrix with up to 4,005 individuals and 32,767 links. NEGOPY provides explicit criteria for clique identification and various network indices such as communication distance, system and individual (node) connectedness, and integration. In the present study, nondirectional communication, forced reciprocation, and 50.01 percent of communication for group identification were used as parameters (Rice, 1979).

In using NEGOPY to test the hypothesis about average number of links, mean strength, average distance, and integrativeness for branches vs. departments, there was no measure of reliability. However, the method has been shown to produce theoretically valid results (Roberts & O'Reilly, 1978; Albrecht, 1979; Danowski, 1980; Rogers & Kincaid, 1980). Unreliability would have made it more difficult to achieve significant results for predictive validity. If we find consistency between the two divisions, it would be an indication of the reliability of the method and the utility of the functional approach to network analysis for future research.

The reliability and validity of the ICA Audit procedure in general, and network analysis/NEGOPY in particular, have been established in numerous field studies and research papers dealing with a variety of organization. There is sufficient consistency across studies conducted in separate sites to confirm the reliability and validity of the Audit and its measurement system (Goldhaber, 1983; Goldhaber & Rogers, 1979; Goldhaber, et al, 1983; Barnett, et al, 1982).

The NEGOPY indicators were used to run significance tests for the difference between means of branches and departments for both the upstate and downstate divisions. This approach allows for cross validation across the divisions. If the results are consistent, there is greater confidence in the generalizability of the results; this, despite the fact that all data come from a single organization rather than from an inter-typical sample of organizations (Kapp & Barnett, 1983).

RESULTS

All four hypotheses were supported by the significance of the difference between the means for branches and departments.

- H1: Departments have more communication links than branches.
For Upstate: Departments, Mean=57, SD=16.28; Branches, Mean=49, SD=14.43 (N=49 departments and 32 branches); $F=5.41$, $p=.02$.
For Downstate: Departments, Mean=48, SD=21.97, Branches, Mean=32, SD=11.36. (N=49 departments and 34 branches). $F=14.07$, $p=.00$.
The null hypothesis that there is no difference between departments and branches in number of links can be rejected.
- H2: Departments have stronger communication links than branches.
For Upstate: Departments, Mean=41.76, SD=11.30; Branches, Mean=33.24, SD=5.62. $F=14.67$, $p=.000$.
For Downstate: Departments, Mean=49.51, SD=14.82; Branches, Mean=37.55, SD=6.81. $F=17.24$, $p=.000$.
The null hypothesis that there is no difference in the communication strength between branches and departments can be rejected.
- H3: Departments are closer in communication distances than branches.
For Upstate: Departments, Mean=1.34, SD=.2033; Branches, Mean=1.41, SD=.1719; $F=3.37$, $p=.07$
For Downstate: Departments, Mean=1.52, SD=.2232; Branches Mean=1.67, SD=.1158; $F=14.95$, $p=.000$.
The null hypothesis that there is no difference between branches and departments in communication distances can be rejected, although, within the upstate division, the level of significance is greater than the .05 level.
- H4: Branches are more highly integrated in the communication system than departments.
For Upstate: Departments, Mean=.735, SD=.082; Branches, Mean=.819, SD=.082; $F=19.86$, $p=.000$.
For Downstate: Departments, Mean=.596, SD=.118; Branches, Mean=.773, SD=.118; Branches, Mean=.773, SD=.105; $F=49.29$, $p=.000$.
The null hypothesis that there is no difference between branches and departments for integrativeness can be rejected.

The results are summarized in Table 1, which shows the means, standard deviations, F values and their respective probability levels for the number of links, strength of link connection, distance, and integrativeness for branches and departments in the upstate and downstate divisions.

-- TABLE 1 ABOUT HERE --

Based on these data, departments have more and stronger communication links, their communication distances are shorter, and they are less integrated in the total communication system. The findings are consistent for both upstate and downstate divisions.

DISCUSSION

The results suggest that a functional approach to network analysis has a great deal of potential utility for the study of organizational communication processes because the theoretical hypotheses were supported. The structural-functional approach to analyzing organizations (Farace, et al, 1977) allows researchers to deal with questions of how and why communication operates in an organization. The function of communication deals with the tasks, the accomplishments of goals and objectives — "the effects or consequences of communication in the organization" (p. 55). The concept of function helps answer the question, "What is communication supposed to do in the organization?" (p. 55). Communication structure is related to the patterns of regularities observed when messages move through the organization. This is in contrast to communication function where ". . . we are dealing with the substance or content of messages. . . ." (p. 59). But function and structure are intimately linked" . . . and major breakdowns in either can render the communication system of an organization inoperative" (p. 59).

Given this theoretical premise, using organizational functions as the unit of analysis, rather than individuals, presents an opportunity to get a macro view of organizational communication. Network analysis can provide a detailed account of how parts (functional units) of an organization operate to keep a system within acceptable limits despite impinging environmental forces. This approach should prove especially useful in large organizations with extensive division of labor, where there is a considerable degree of depersonalization and high turnover. In these situations, communication takes place among roles with individuals performing functions rather than among individuals per se. Also, in the case of physically disparate organizations with a high degree of differentiation, there is a need for integration in highly uncertain environments. Here, the functional approach to network analysis should be a useful method (Lawrence & Lorsch, 1967; Galbraith, 1977). This should be especially true for multinational, matrix organizations where territory becomes increasingly important (Davis & Lawrence, 1977).

Network analysis, using individuals as the unit of analysis, may continue to be desirable in smaller organizations. There are two primary reasons for this: 1) a census of the population is more viable, albeit difficult even in organizations of 75 or more; and 2) smaller organizations may not be differentiated into functions to the extent of larger organizations. Also, the individual could serve as the unit of analysis in cases where the organization reflects the personality and communication style of an individual entrepreneur as in the case of Bendix, Chrysler, Hewlett-Packard, and Occidental Petroleum. But for highly differentiated complex organizations with multiple locations, the functional approach offers a number of important advantages.

First, data collection and manipulation can be tremendously simplified by using a sample of personnel rather than the unrealistic constraint of a census as suggested by Richards (1975) which requires a return of 90 to 95%. Sampling will also bring cost reductions to the procedure. It could be conducted as a stratified sample. The strata would be the organization's defined units. A proportional or disproportional procedure could be conducted depending on the relative populations of the functional units. A disproportionate sample would be used to guarantee sufficient responses from small units.

Second, using organizational functions or task groups (Danowski, 1980) as the unit of analysis gives researchers a chance to use data collection methods that do not rely on self-report data. Bernard and colleagues (Bernard & Killworth, 1977; Bernard, Killworth & Sailer, 1980, 1981, 1982) have argued that self-report data does not yield reliable information about who in a group actually interacts with whom. As an alternative to relying on informants, Danowski (1982) and Rice (1982) suggest using data generated by computer-based telecommunications systems. Since many individuals from the same organizational unit may have access to a single computer account or access code, these alternative methods of gathering network data may prove more appropriate for analyses that focus on functional units rather than individuals.

Third, the functional approach to network analysis allows a shift from a focus on dyadic communication of individuals to a systems approach with a new unit of analysis—the organization's units (Rogers & Kincaid, 1981). In this way, comparisons between the formal organizational structure, as defined by management, and the actual communication structure, as defined by the flow of information among functional units, becomes more meaningful (Goldhaber, et al, 1978).

Fourth, this approach allows for the examination of contacts external to the organization's boundary. Since external contacts are with generic types rather than individuals, it follows that the best way to examine this phenomenon is to formulate a typology of potential boundary-spanning linkages and include this list in the network instrument. This allows organization members to select from categories rather than naming individuals outside the organization with whom they communicate, such as vendors, customers, attorneys, government agencies, competitors, corporate headquarters, and so on.

Boundary-spanning activity has been identified by many researchers as a critical function in the survival and success of organizations (Kapp & Barnett, 1983; Cyret & Marsh, 1963; Thompson, 1967; Aldrich & Herker, 1977; Aldrich, 1979; Tushman, 1977, 1979). It is one of the principal ways an organization can absorb environmental inputs and take on negative entropy (Katz & Kahn, 1978). Boundary spanners provide permeability for the organization and allow it to be influenced by its environment (Leifer & Huber, 1977; Aiken & Hage, 1972). "Boundary roles link structures and activities to environmental conditions in the form of buffering, moderating, and influencing external events" (Aldrich, 1979:249). The

information processing function of boundary spanners helps create variation in the organization and the external representation role helps maintain legitimacy. In short, the boundary is the point of organizational interface with the environment.

Despite the importance of external communication, network analysis has focused almost exclusively on the communication patterns internal to organizations. In the present study, there were definite boundary-spanning linkages between the upstate and downstate divisions. We found that upstate was more oriented to downstate than downstate was to upstate. That is, upstate reported more and stronger links to downstate than downstate reported to upstate. There were 45 links from upstate and only 17 from downstate. The mean strength of those links was 75.43 upstate and 37.65 downstate. Also, upstate was closer to downstate, than downstate was to upstate. The distances were 1.454 and 1.837. This may be because the corporations headquarters are located upstate and that the downstate division was recently brought into the organization through a merger. The results of this study are a good indication that network analysis can be expanded to include external sources of information from a functional perspective.

The functional analysis in the research project reported here was a stop-gap measure arising from the exigencies of the situation. Quite simply, it was the only alternative under the circumstances. The next step in developing this approach to network analysis is to design a project using functional analysis from the start. This would allow a research team to draw a stratified random sample and design an instrument suitable for this method.

In a study in progress at this time, a television station is being surveyed to compare communication networks when functional and individual units of analysis are used simultaneously. This research project will also attempt to determine external linkages to evaluate organizational boundary-spanning activities.

SUMMARY

This paper is based on general systems theory and the structural-functional approach to analyzing organizations which allows us to deal with questions of how and why communication operates in an organization. (Farace, et al, 1977). It is important to use defined task groups as the unit of analysis for a number of reasons, e.g., ease of data collection, shift from dyadic focus to systems approach, getting away from self-report data.

We have described a network analysis study conducted in a large New York State financial institution with two divisions in which a functional analysis was performed. Rather than using individuals as the unit of analysis, data were aggregated for each function using a two-step process and input to NEGOPY (Richards, 1975). The NEGOPY indicators were used to run significant tests for the difference between the organization's branches and departments. All four hypotheses

were supported indicating that departments have more and stronger communication links, their communication distances are shorter, and they have higher integration scores than branches.

The functional approach to network analysis provides advantages compared to using the individual as the unit of analysis and it is compatible with the structural-functional approach to the study of organizational communication processes (Farace, et al, 1977). The network analysis reported here was an alternative method selected under adverse conditions. Future research is planned using a functional perspective from the beginning.

TABLE 1: Means, standard deviations, values of F, number of links, strength of link connection, distance and integrativeness for branches and departments in the upstate and downstate divisions.

UPSTATE

	<u>BRANCHES</u>		<u>DEPARTMENTS</u>		
	<u>MEAN</u>	<u>SD</u>	<u>MEAN</u>	<u>SD</u>	
Number of Links	49	14.43	57	16.28	F=5.41, p=.02
Strength	33.24	5.62	41.76	11.30	F=14.67, p=.00
Distance	1.41	.172	1.34	.203	F=3.37, p=.07
Integrativeness	.819	.085	.735	.082	F=19.86, p=.00

DOWNSTATE

	<u>MEAN</u>	<u>SD</u>	<u>MEAN</u>	<u>SD</u>	
Number of Links	32	11.36	48	21.97	F=14.07, p=.00
Strength	37.55	6.81	49.51	14.82	F=17.24, p=.00
Distance	1.67	.116	1.52	.223	F=14.95, p=.00
Integrativeness	.773	.105	.596	.118	F=49.29, p=.00

REFERENCES

- Aiken, M. & Hage, J. "Organizational Interdependence and Intraorganizational Structure." American Sociological Review, 1968, 33: 912-930.
- Aiken, M. & Hage, J. "Organizational Permeability, Boundary Spanners, and Organizational Structure," Revision of a paper presented to the American Sociological Association, New Orleans, La., August, 1972.
- Albrecht, T. L. "The Role of Communication in Perception of Organizational Climate." In Nimmo, D. (Ed.), Communication Yearbook 3, New Brunswick, NJ: Transaction, 1979.
- Aldrich, H.E. Organizations and Environments. Englewood Cliffs, NJ: Prentice-Hall, 1979.
- Aldrich, H.E. & Herker, D. "Boundary Spanning Roles and Organization Structure." Academy of Management Review, 1977, 217-230.
- Barnett, G.A. "The Measure of Organizational Culture." in Goldhaber, G.M. & O.A. Wilo (Eds), Proceedings of Organizational Communication Conference, Buffalo: SUNY, 1979.
- Barnett, G. A., Hamlin, D. M., & Danowski, J.A. "The Use of Fractionation Scales for Communication Audits." In Burgoon, M. (Ed.), Communication Yearbook 5. New Brunswick, NJ: Transaction, 1982.
- Barnett, G. A. & M. T. Palmer. "Longitudinal Network Analysis Using Multi-dimensional Scaling." Paper presented to International Communication Association, Dallas, 1983.
- Bernard, H. R. & Killworth, P.D. "Informant Accuracy in Social Network Data II." Human Communication Research, 1977, 4: 3-18.
- Bernard, H. R., Killworth, P.D., & L. Sailer. "Informant Accuracy in Social Network Data IV: A Comparison of Clique-Level Structure in Behavioral and Cognitive Network Data." Social Networks, 1980, 1: 191-218.
- Bernard, H. R., Killworth, P. D., & Sailer, L. "A Note of Inferences Regarding Subgroups: Response to Burt and Bittner." Social Networks, 1981, 3: 89-92.
- Bernard, H. R., Killworth, P. D., & Sailer, L. "Informant Accuracy in Social Network Data V: An Experimental Attempt to Predict Actual Communication from Recall Data." Social Science Research, 1982, 11: 30-66.
- Burns, T. & Stalker, G. M. The Management of Innovation. London: Tavistock, 1961.
- Cyert, R. & March, J. A Behavioral Theory of the Firm. Englewood Cliffs, NJ: Prentice-Hall, 1963.

- Danowski, J.A. "An Information Processing Model of Organizations: A Focus on Environmental Uncertainty and Communication Network Structuring." Paper presented to International Communication Association, New Orleans, 1974.
- Danowski, J.A. "Uniformity of Group Attitude-belief and Connectivity of Organizational Communication Networks for Production, Innovation and Maintenance." Human Communication Research, 1980, 6: 299-308.
- Danowski, J.A. "Computer-Mediated Communication: A Network Based Content Analysis Using a CBBS Conference," In M. Burgoon (Ed.), Communication Yearbook 6. Beverly Hills, CA; Sage, 1983.
- Davis, S. M. & Lawrence, P.R. Matrix. Reading, MA: Addison-Wesley, 1977.
- Duncan, R. "Multiple Decision Making Structures in Adapting to Environmental Uncertainty: The Impact on Organization Effectiveness," Human Relations, 1971, 26: 273-291.
- Durkheim, E. Division of Labor in Society. New York: Free Press, 1933.
- Farace, R. V. Monge, P. R. & Russell, H.M. Communicating and Organizing. Reading, MA: Addison-Wesley, 1977.
- Galbraith, J. Designing Complex Organizations. Reading, MA: Addison-Wesley, 1973.
- Galbraith, J. Organizational Design. Reading, MA: Addison-Wesley, 1977.
- Goldhaber, G.M. Organizational Communication. (3rd Ed.), Dubuque, Iowa: William C. Brown, 1983.
- Goldhaber, G. M., Dennis, H.S., Richetto, G.M., & Wilo, O. A. Information Strategies. Norwood, NJ: Ablex, 1983.
- Goldhaber, G. M. & Rogers, D. P. Auditing Organizational Communication Systems: The ICA Communication Audit. Dubuque, Iowa: Kendall/Hunt, 1979.
- Goldhaber, G. M., Yates, M., Porter, T. & Lesniak, R., "Organizational Communication: 1978," Human Communication Research, 1978, 5: 76-97.
- Granovetter, M. "The Strength of Weak Ties," American Journal of Sociology, 1973, 73: 1361-1380.
- Hage, J. Communication and Control: Cybernetics in Health and Welfare Settings. New York: Wiley, 1974.
- Hage, J., Aiken, M., and C. B. Marrett, "Organizational Structure and Communications," American Sociological Review, 1971, 36: 860-871.

- Kapp, J. E. & Barnett, G. A. "Predicting Organizational Effectiveness from Communication Activities: A Multiple Indicator Model." Human Communication Research, 1983, 9: 239-254.
- Katz, D. & Kahn, R. L. The Social Psychology of Organizations. (2nd Ed.), New York: John Wiley, 1978.
- Killworth, P. D. and R. H. Bernard, "Informant Accuracy in Social Network Data," Human Organization, 1976, 35: 269-286.
- Lawrence, P. & Lorsch, J., "Differentiation and Integration in Complex Organizations," Administrative Science Quarterly, 1967, 12: 1-47.
- Leifer, R. & Huber, G. P., "Relations among Perceived Environmental Uncertainty, Organizational Structure, and Boundary Spanning Behavior." Administrative Science Quarterly, 1977, 22: 235-247.
- March, J. G. and H. A. Simon, Organizations. New York: Wiley, 1958.
- Monge, P., The Conceptualization of Human Communication from Three Systems Paradigms. Ph.D. Thesis. East Lansing: Michigan State University, 1972.
- Nagel, E. Logic Without Metaphysics, Glencoe, IL: Free Press, 1956.
- Parsons, T., The Social System, New York: Free Press, 1951.
- Parsons, T., Structure and Process in Modern Society. New York: Free Press, 1960.
- Rice, R., "Parameter Sensitivity of the NEGOPY Network Analysis Computer Program." Paper presented to the International Communication Association, Philadelphia, 1979.
- Rice, R., "Communication Networking in Computer-Conferencing Systems: A Longitudinal Study of Group Rules and System Structure." In M. Burgoon, (Ed.) Communication Yearbook 6. Beverly Hills, CA: Sage, 1982.
- Richards, W., "A Manual for Network Analysis: Using the NEGOPY Network Analysis Program." Stanford, CA: Institute for Communication Research, Stanford University, 1975.
- Richards, W., "A Coherent Systems Methodology for the Analysis of Human Communication Systems. Ph.D. Thesis, Stanford, CA: Stanford University, 1976.
- Roberts, K. H. & O'Reilly, C.A., "Organizations as Communication Structures: An Empirical Approach," Human Communication Research, 1978, 4: 283-293.
- Rogers, E. M. and R. Agarwala-Rogers, Communication in Organizations. New York: Free Press, 1976.

- Rogers, E. M. & Kincaid, D. L., Communication Networks: Toward a New Paradigm for Research. New York: The Free Press, 1981.
- Romney, A. K. & K. Faust, "Predicting the Structure of a Communication Network for Recalled Data." Social Networks, 1983, 4: 285-304.
- Thompson, J., Organizations in Action. New York: McGraw-Hill, 1967.
- Torgerson, W.S., Theory and Methods of Scaling. New York: Wiley, 1958.
- Tushman, M. L., "Special Boundary Roles in the Innovation Process," Administrative Science Quarterly, 1977, 22: 587-605.
- Tushman, M. L., "Work Characteristics and Subunit Communication Structure: A Contingency Analysis" Administrative Science Quarterly, 1979, 24: 82-98.
- Weick, K., Social Psychology of Organizing. Reading, MA: Addison-Wesley, 1969.
- Wigand, R. T., "Communication and Interorganizational Relationships among Complex Organizations in Social Service Settings." Paper presented to International Communication Association, Portland, 1976.